



A.D. 1867, 15th OCTOBER. N^o 2894.

S P E C I F I C A T I O N

OF

THOMAS HENRY BAKER

AND

THOMAS WOODROFFE.

TREATING AND PURIFYING SEWAGE.

L O N D O N :

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY :

PUBLISHED AT THE GREAT SEAL PATENT OFFICE,
25, SOUTHAMPTON BUILDINGS, HOLBORN.

Price 3s. 6d.

1868.



A.D. 1867, 15th OCTOBER. N° 2894.

Treating and Purifying Sewage.

LETTERS PATENT to Thomas Henry Baker, Engineer, and Thomas Woodroffe, Builder, both of Tonbridge, in the County of Kent, for the Invention of "IMPROVEMENTS IN TREATING SEWAGE OR OTHER LIQUID MATTERS SO AS TO PURIFY THE MORE FLUID PORTIONS THEREOF, AND RECOVER SOME OF THE CONTAINED MATTERS FOR RE-USE IN MANUFACTURING PROCESSES, AND IN THE PREPARATION OF OTHERS FOR USE AS MANURES."

Sealed the 15th April 1868, and dated the 15th October 1867.

PROVISIONAL SPECIFICATION left by the said Thomas Henry Baker and Thomas Woodroffe at the Office of the Commissioners of Patents, with their Petition, on the 15th October 1867.

We, THOMAS HENRY BAKER, Engineer, and THOMAS WOODROFFE, Builder, both of Tonbridge, in the County of Kent, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN TREATING SEWAGE OR OTHER LIQUID MATTERS SO AS TO PURIFY THE MORE FLUID PORTIONS THEREOF, AND RECOVER SOME OF THE CONTAINED MATTERS FOR RE-USE IN MANUFACTURING PROCESSES, AND IN THE PREPARATION OF OTHERS FOR USE AS MANURES," to be as follows:—

10 In carrying out our improvements the sewage or other liquid matters from towns or other places, or from works where manufacturing or other processes are carried on with a tendency to render impure the sewage or other liquid

Baker & Woodroffe's Improvements in Treating and Purifying Sewage.

matters passing therefrom, is allowed to flow into wells or receivers, of which there may be several to be filled in succession if desired, better to meet the requirements or occasions of violent storms, or to obtain greater purification, or for other purposes. The matters passing into each of these wells or receivers rises upwards through filtering matters supported in a frame at the upper 5 part of each of such wells or receivers, by which the watery or more fluid portion is separated therefrom, and as it rises above the filtering matter such more fluid portion may flow away by suitable conduits to a river or other watercourse, or it may be collected if desired for irrigating or other purposes. The filtering media is composed of sand, charcoal, tan, peat, fresh dried 10 mould, shingle, crushed granite, or other suitable matter, and it is held between strong frames formed reticulate for the free passage of the liquid matters through the filtering media, and these frames are held in position by set screws and nuts, or otherwise, so that the frames may be removed or replaced and readily fixed so as to resist the pressure from beneath at pleasure, and also to 15 regulate the density of the filtering media employed, as may be desired.

We also in some cases direct steam or air into the lower portions of these wells or receivers to agitate or keep in motion the more solid portions of the matters in the lower part thereof, and thereby aid in keeping the walls of these wells or receivers free from matter adhering thereto. The more solid portions of 20 the matters left in the wells or receivers is drawn therefrom by pumps or suitable exhausters through pipes or channels, which by preference enter the upper portion of each well or receiver just below the filtering media, and which may have a flexible connection to admit of the lower portion or mouth thereof being shifted to different parts of the well or receiver. Or the matters in 25 these wells may be allowed to flow off through taps or sluices at the lower portion. The matters thus drawn or allowed to flow off are conducted to other receivers the wall or surrounding case of each of which is formed to hold deodorizing, filtering, purifying, or disinfecting material, through which a further drainage takes place into receivers or conduits. For convenience in 30 use this outer wall is formed hollow, and of reticulate or other openwork, so that as the deodorizing, filtering, purifying, or disinfecting material becomes spent or absorbed it may be removed by suitable apertures for the purpose, or a fresh supply of it be introduced. As the matters flow into these secondary receivers we mix with them baked or heated earth, or other deodorizing or 35 purifying or disinfecting matter, which is fed in regulated quantities from a reservoir thereof by means of endless chains of buckets or otherwise, and suitable hoppers or troughs. The more solid matter thus collected, and after it has been

Baker & Woodroffe's Improvements in Treating and Purifying Sewage.

allowed to drain in these secondary receives is then removed therefrom through
suitable openings in their walls, and reduced by breaking, or grinding and rolling,
and spread out in suitable chambers to be acted upon by the atmosphere to
undergo fermentation. After this it may be sifted to various degrees of fineness
5 according to the use to which it may be applied. If chemical matters such as
those from paper or other works where chemical matters are employed are mixed
with the liquid to be acted upon, the liquid or more solid matters separated
as herein stated may be treated by chemical agents, as is well understood for
the recovery and re-use of such chemicals. The matters used for the purpose of
10 deodorizing, filtering, and disinfecting after use as here stated may be cleansed
or revived for re-use by drying and heating in retorts, and the gas generated
by such treating may be used for lighting or heating purposes. The dome or
chamber in which the retorts are set may be formed of plates of iron or fire-
brick overlapping each other, so that the heat may pass through interstices or
15 openings left between the overlappings, whilst dust and other matters will be
prevented from passing into the furnace below. The upper portion of the
dome or chamber is provided with a chamber to receive earthy or other
matter to be dried, and doors for the withdrawal of such matters.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed
20 by the said Thomas Henry Baker and Thomas Woodroffe in the Great
Seal Patent Office on the 15th April 1868.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, THOMAS
HENRY BAKER, Engineer, and THOMAS WOODROFFE, Builder, both of Ton-
bridge, in the County of Kent, send greeting.

25 **WHEREAS** Her most Excellent Majesty Queen Victoria, by Her Letters
Patent, bearing date the Fifteenth day of October, in the year of our Lord
One thousand eight hundred and sixty-seven, in the thirty-first year of Her
reign, did, for Herself, Her heirs and successors, give and grant unto us,
the said Thomas Henry Baker and Thomas Woodroffe, Her special licence
30 that we, the said Thomas Henry Baker and Thomas Woodroffe, our executors,
administrators, and assigns, or such others as we, the said Thomas Henry
Baker and Thomas Woodroffe, our executors, administrators, and assigns,
should at any time agree with, and no others, from time to time and at all
times thereafter during the term therein expressed, should and lawfully
35 might make, use, exercise, and vend, within the United Kingdom of Great

Baker & Woodroffe's Improvements in Treating and Purifying Sewage.

Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for
“IMPROVEMENTS IN TREATING SEWAGE OR OTHER LIQUID MATTERS SO AS TO PURIFY
THE MORE FLUID PORTIONS THEREOF, AND RECOVER SOME OF THE CONTAINED MATTERS
FOR RE-USE IN MANUFACTURING PROCESSES, AND IN THE PREPARATION OF OTHERS
FOR USE AS MANURES,” upon the condition (amongst others) that we, the said 5
Thomas Henry Baker and Thomas Woodroffe, our executors or administrators,
by an instrument in writing under our or their hands and seals, or under
the hand and seal of one of us or them, should particularly describe and
ascertain the nature of the said Invention, and in what manner the same
was to be performed, and cause the same to be filed in the Great Seal 10
Patent Office within six calendar months next and immediately after the
date of the said Letters Patent.

NOW KNOW YE, that we, the said Thomas Henry Baker and Thomas
Woodroffe, do hereby declare the nature of the said Invention, and in what
manner the same is to be performed, to be particularly described and 15
ascertained in and by the following statement thereof, that is to say:—

In carrying out our improvements the sewage or other liquid matters from
towns or other places, or from works where manufacturing or other processes are
carried on with a tendency to render impure the sewage or other liquid
matters passing therefrom is allowed to flow into wells or receivers, of which 20
there may be several to be filled in succession if desired, better to meet the
requirements or occasions of violent storms, or to obtain greater purification, or
for other purposes. The matters passing into each of these wells or receivers
rises upwards through filtering materials supported in a frame at the upper
part of each of such wells or receivers, by which the watery or more fluid portion 25
is separated therefrom, and as it rises above the filtering matter such more
fluid portion may flow away by suitable conduits to a river or other water-
course, or it may be collected if desired for irrigating or other purposes.

We also in some cases direct steam into the lower portions of these wells
or receivers to agitate or keep in motion the more solid portions of the matters 30
in the lower part thereof, and thereby aid in keeping the walls of these wells
or receivers free from matter adhering thereto. The more solid portion of
the matters left in the wells or receivers is drawn therefrom by pumps or
suitable exhausters through pipes or channels, which by preference enter the
upper portion of each well or receiver just below the filtering media, and 35
which may have a flexible connection to admit of the lower portion or mouth
thereof being shifted to different parts of the well or receiver; or the matters
in these wells may be allowed to flow off through taps or sluices at the lower

Baker & Woodroffe's Improvements in Treating and Purifying Sewage.

portion. The matters thus drawn or allowed to flow off are conducted to other receivers, the wall or surrounding case of each of which is formed to hold deodorizing, filtering, purifying, or disinfecting material through which a further drainage takes place into receivers or conduits. For convenience
5 in use this wall is formed hollow, and in parts of reticulate or other open-work, so that as the deodorizing, filtering, purifying, or disinfecting material becomes spent or absorbed it may be removed by suitable apertures for the purpose, or a fresh supply of it being introduced. As the matters flow into these secondary receivers we mix with them baked or heated earth or other
10 deodorizing, or purifying, or disinfecting matter, which is fed in regulated quantities from a reservoir thereof by means of endless chains of buckets, or otherwise, and suitable hoppers or troughs. The more solid matter thus collected, and after it has been allowed to drain in these secondary receivers, is then removed therefrom through suitable openings in their walls, and reduced
15 by breaking, or grinding and rolling, and spread out in suitable chambers to be acted upon by the atmosphere to undergo fermentation. After this it may be sifted to various degrees of fineness, according to the use to which it may be applied. If chemical matters, such as those from paper or other works where chemical matters are employed, are mixed with the liquid to be acted
20 upon the liquid or more solid matters, separated as herein stated, may be treated by chemical reagents, as is well understood for the recovery and re-use of such chemicals. The matters used for the purpose of deodorizing, filtering, and disinfecting after use, as here stated, may be cleansed or revived for re-use by drying and heating in retorts, and the gas generated by such treating
25 may be used for lighting or heating puposes, The dome or chamber in which the retorts are set may be formed of plates of iron or fire-brick overlapping each other, so that the heat may pass through interstices or openings left between the overlappings, whilst dust and other matters will be prevented from passing into the furnace below. The upper portion of the dome or
30 chamber is provided with a chamber to receive earthy or other matter to be dried, and doors for the withdrawal of such matters.

But that the Invention may be fully understood we will by the aid of the accompanying Drawings proceed to describe means pursued by us in carrying the same into effect.

35 DESCRIPTION OF THE DRAWINGS.

Figure 1 shows a plan view, and Figure 2 a sectional view of one part of the apparatus; Figure 3 shows a transverse section of part of Figures 1 and 2,

Baker & Woodroffe's Improvements in Treating and Purifying Sewage.

taken through the lines (1), (1); and Figure 4, a section of part of Figure 1 through the lines (2), (2). In all the Figures of the Drawings the same letters are employed to indicate corresponding parts wherever they occur.

a, a, shows the conduit, by which the sewage or other matter from a town or other place, or from works where manufacturing or other processes are carried on, with a tendency to render impure the sewage or other liquid matters passing therefrom is conducted to wells or receivers *b, b*. In passing to these wells such sewage or other matter to be treated may pass into the lower part of a chamber *c*, and in rising therein pass through the incline grating *c*¹, by which stones or other large matters carried forward with the sewage may be strained therefrom, and the strained sewage matter will then flow from the chamber *c* by the passage *a*¹ to a well *b*. In the plan view we have shown two of these receiving wells *b*, but their number will be regulated by the quantity of matter to be acted upon and other circumstances. The matters passing into each of these wells or receivers *b* rise therein upwards through filtering matters *b*¹, *b*², *b*³, supported between frames *b*⁴, *b*⁵, by which the water or more fluid portion is separated therefrom, and as such watery or more fluid portion rises above the filtering matter contained between the frames *b*⁴, *b*⁵, it flows over into the channel *b*⁶, and thence by suitable outlets *b*^{*} therefrom and conduits to a river or other watercourse, or it may be collected, as already stated, for irrigating or other purposes. The filtering media employed at *b*¹, *b*², *b*³, may be composed of sand, charcoal, tan, peat, fresh-dried mould, shingle, crushed granite, or other suitable matter, and the frames *b*⁴, *b*⁵, between which it is held, are formed reticulate for the free passage of the liquid matters through the filtering media, and these frames are held in position by set screws *b*⁷, *b*⁷, or otherwise, to admit of their ready removal or replacement as may be required, and so that they may be capable of resisting the pressure from beneath to which they may be exposed. These frames also serve by applying more or less pressure to the tightening screws or other means to regulate the density of the filtering media employed. *d, d*, show pipes, by which steam may be conducted into the lower part of the wells *b*, and allowed to escape therefrom in jets to agitate or keep in motion the more solid portions of the matters in the lower part of such wells, and thereby aid, as stated, in keeping the walls thereof free from matter adhering to them. *b*⁸ is a wall surrounding the upper portion of the well, and *b*⁹ is a footway within this wall to facilitate operations to the well; *e* is a pump, by which the more solid portions of the matters left in such wells may be pumped out by the pipe *e*¹, *e*², the part *e*² being formed of flexible material to admit of its

Baker & Woodroffe's Improvements in Treating and Purifying Sewage.

being more readily shifted to different parts of the well or receiver, or when the wells or receivers are placed in position to admit of it the matters from the lower portions thereof may be allowed to flow therefrom by an outlet b^{10} , or other suitable outlet, as shown by Figure 5, where B represents a slight
5 modification of a well b just described in respect of Figures 1 and 2, the parts in this case being more particularly adapted to purifying or cleansing the liquid matters from paper works. C, Figure 5, represents the section of a well or receiver, such as may be employed to receive the matters from wells such as last referred to. The surrounding enclosure or wall of these wells or
10 receivers is formed hollow to receive deodorizing, filtering, purifying, or disinfecting material f between the casings f^1, f^2 . The case f^2 is formed of reticulate or other openwork to admit of the free action of the materials contained between the parts f^1, f^2 , of the wall on the matters under operation. The drainings from the well C, Figure 5, pass into the channel g , and thence
15 by suitable conduits to a well or receiver to be reacted upon or otherwise, as may be desired.

Figure 6 shows an arrangement by which baked or heated earth or other deodorizing, or purifying, or disinfecting matter may be fed through a hopper D and mixed with the sewage matters flowing into a well C; h, h , are
20 a series of buckets affixed to an endless chain h^1 supported on a pair of rollers h^2 to one of which rotary motion is given in order to move the endless chain and enable the buckets h to take up matters contained in a suitable reservoir i and deposit them in the hopper D. The pipe E with which the hopper D is connected may be supplied by the pump e , Figure 2, or otherwise, with the
25 sewage matter to be treated; C^1 (Fig. 7) are openings for the removal of the deodorizing, filtering, or other material as it becomes spent or absorbed; C^2 is another opening in the walls of the well C through which the more solid matter collected in that well may be removed as required. The openings C^1 and C^2 are each provided with sliding doors or covers C^3 and C^4 by which they
30 may be closed when required.

Figure 7 shows an external view of a well C, Figure 6.

Figure 8 represents a section of apparatus by which the more solid matter collected in these secondary receivers may be reduced, ground, and acted upon to undergo fermentation. The matters are placed in the hopper k , where they
35 come in contact with the revolving knives or arms k^1 , and with the stationary arms or grating k^2 , the arms k^1 are affixed to the axis k^3 to which rotary motion is given by a steam engine or other suitable power. The matters thus broken then pass between the pair of rollers l, l , which by preference travel at different

Baker & Woodroffe's Improvements in Treating and Purifying Sewage.

surface speeds, thereby to act more readily in grinding the broken matter into fine particles, and are formed hollow to receive steam or other heating media if desired. If desired other rollers may be further employed to bring the matters to the degree of fineness desired. The matters as reduced fall down the incline plane m , or are otherwise conducted to the surface n , where they 5 are spread out to be subjected the better to the action of the atmosphere. To facilitate the process of fermentation the surface n forms part of a close chamber n^1 , which may be heated by steam, hot water, or hot air supplied through a pipe n^2 or otherwise. If chemical matters, such as those from paper or other works where chemical matters are employed, are mixed with the 10 liquid to be acted upon the liquid or more solid matters separated as herein stated may be treated by chemical re-agents, as is well understood, for the recovery and re-use of such chemicals.

Figure 9 shows a sectional front view of apparatus for cleansing or revivifying the matters after use, and for re-use in the process of deodorizing, 15 filtering and disinfecting.

Figures 10, 11, and 12 show a sectional view, a side view, and a plan view of parts thereof. o is a retort in which such matters may be placed, and any gas generated therein will be conducted away by the pipe p into the close well q , the water in which should be maintained at a level above the mouth 20 of the pipe p sufficient to seal that pipe and prevent the return of gas, whilst the gas flowing therein will pass away from the well q by the pipe r to a holder s , which is of the character of those ordinarily employed in the storing of coal gas. t is a pipe of supply from this holder, by which the gas obtained may be conducted to be employed in aid of the fire in the fire-place u 25 in heating the matters in the retort, or for other use. The dome of the chamber in which the retort o is set is formed of plates of iron or fire-bricks v placed so as to admit of the passage of the heat between them to matters placed above the dome to be dried. w, w , are doors for the withdrawal of the matters from the chamber above the dome v . x is a well to collect any 30 heavier matters flowing over by the pipe p into the well q , and y is a cistern with ball cock to regulate the height of water in the wells x and q . z is a pump for drawing off the matters from the well x .

Having thus described our Invention, and means by which the same may be carried into effect, we would have it understood that we do not confine 35 ourselves to the precise details shown and described, as these may be varied without departing from the peculiar character of the Invention; but what we do claim is, the adaptation or combination of means for treating sewage or

Baker & Woodroffe's Improvements in Treating and Purifying Sewage.

other liquid matters so as to purify the more fluid portions thereof and recover some of the contained matters for re-use, and for the preparation of others for use as manures, substantially as described. |

5 In witness whereof, we, the said Thomas Henry Baker and Thomas Woodroffe, have hereunto set our hands and seals, this Fifteenth day of April, in the year of our Lord One thousand eight hundred and sixty-eight.

T. H. BAKER. (L.S.)

THO^s. WOODROFFE. (L.S.)

LONDON :

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1868.

FIG. 4.

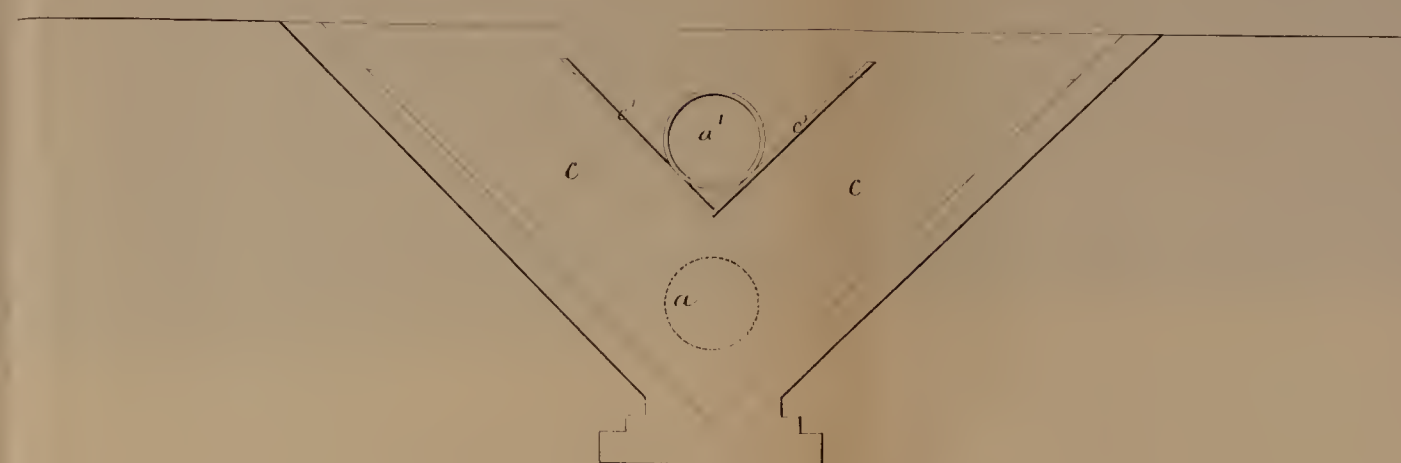
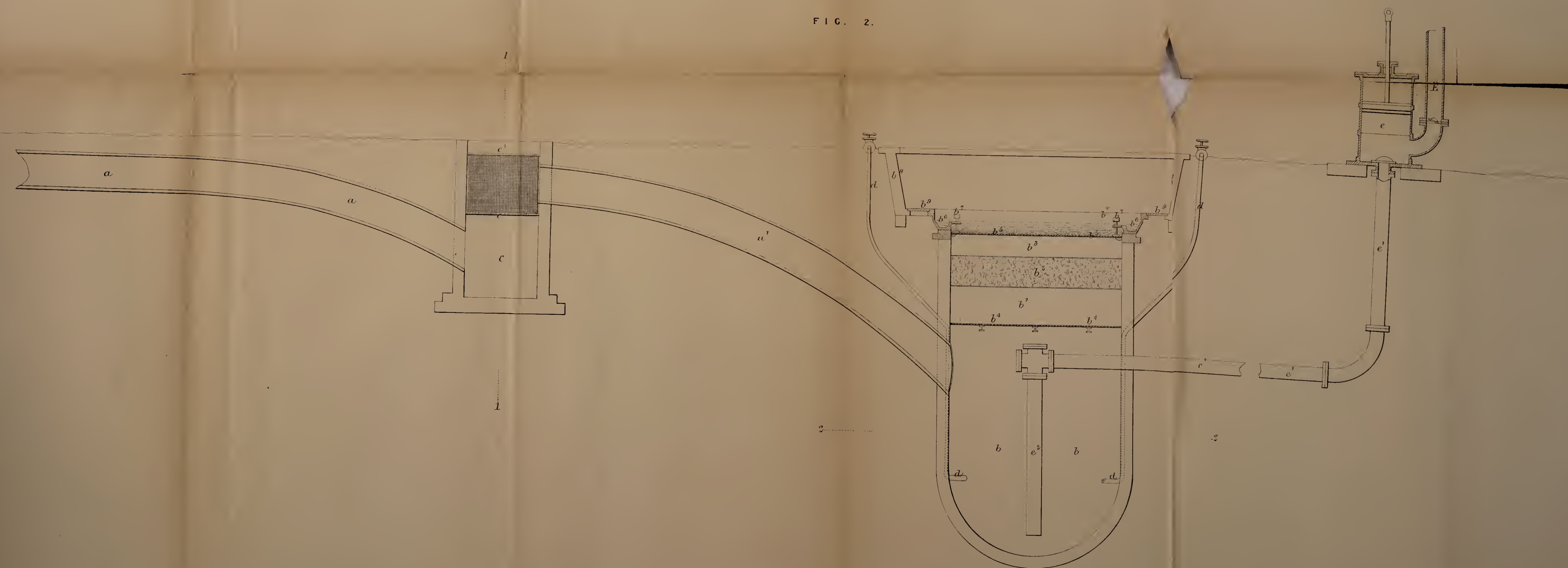


FIG. 2.



LONDON Printed by GEORGE EDWARD FIVE, and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty 1868

Drawn on Stone by Malby & Sons

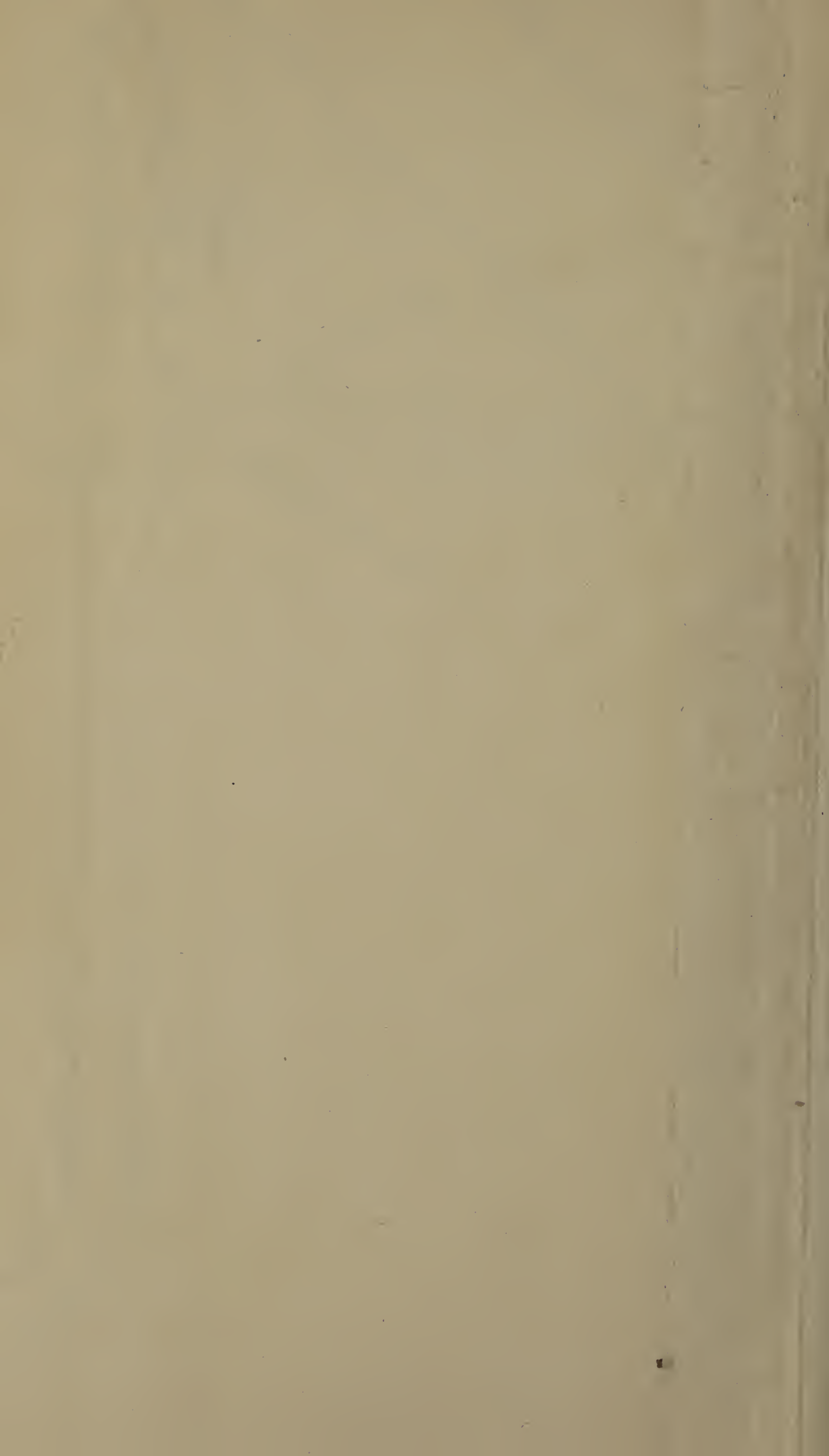
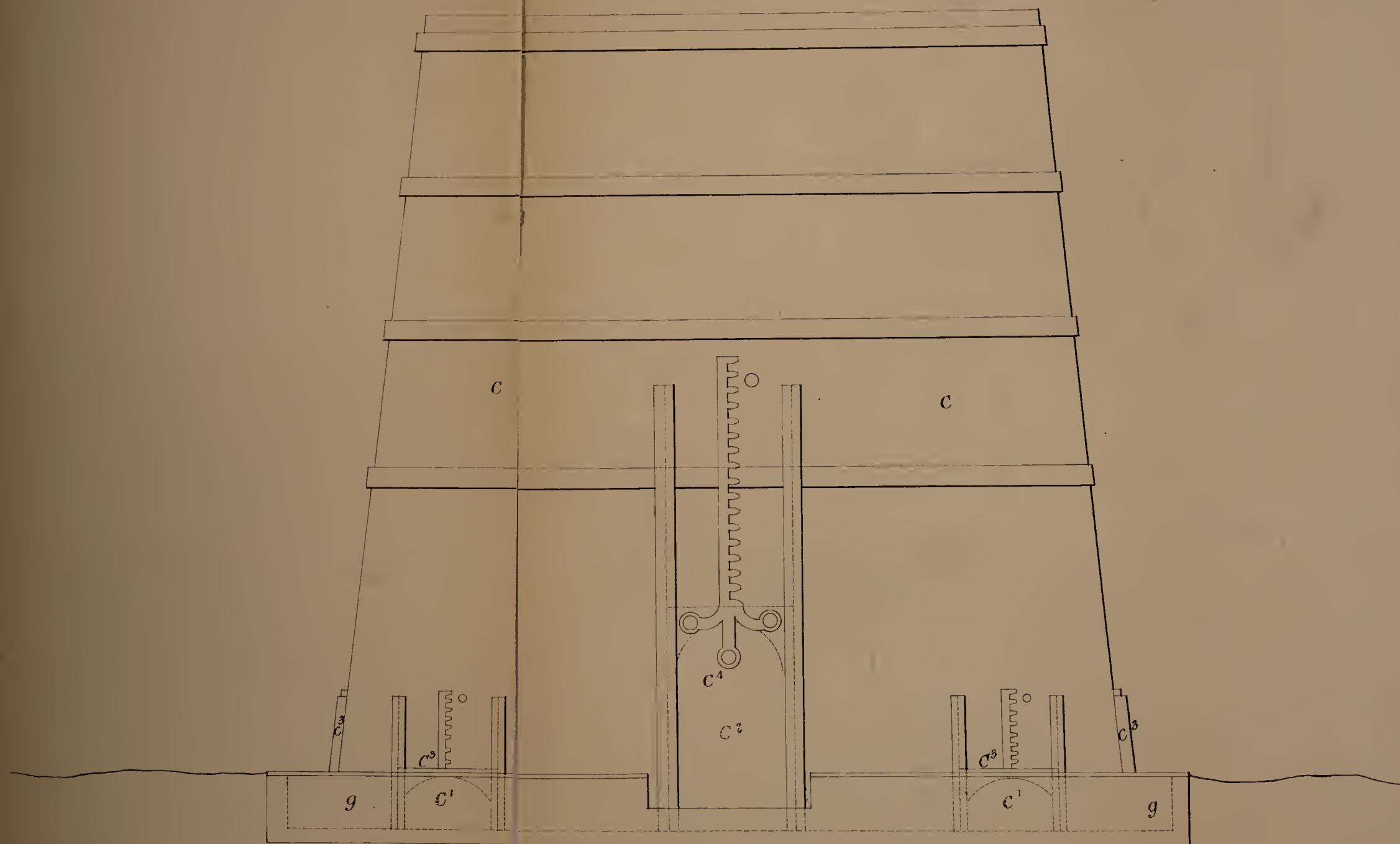


FIG. 7.



The filed drawing is partly colored.

Drawn on Stone by Malby & Sons

FIG. 8.

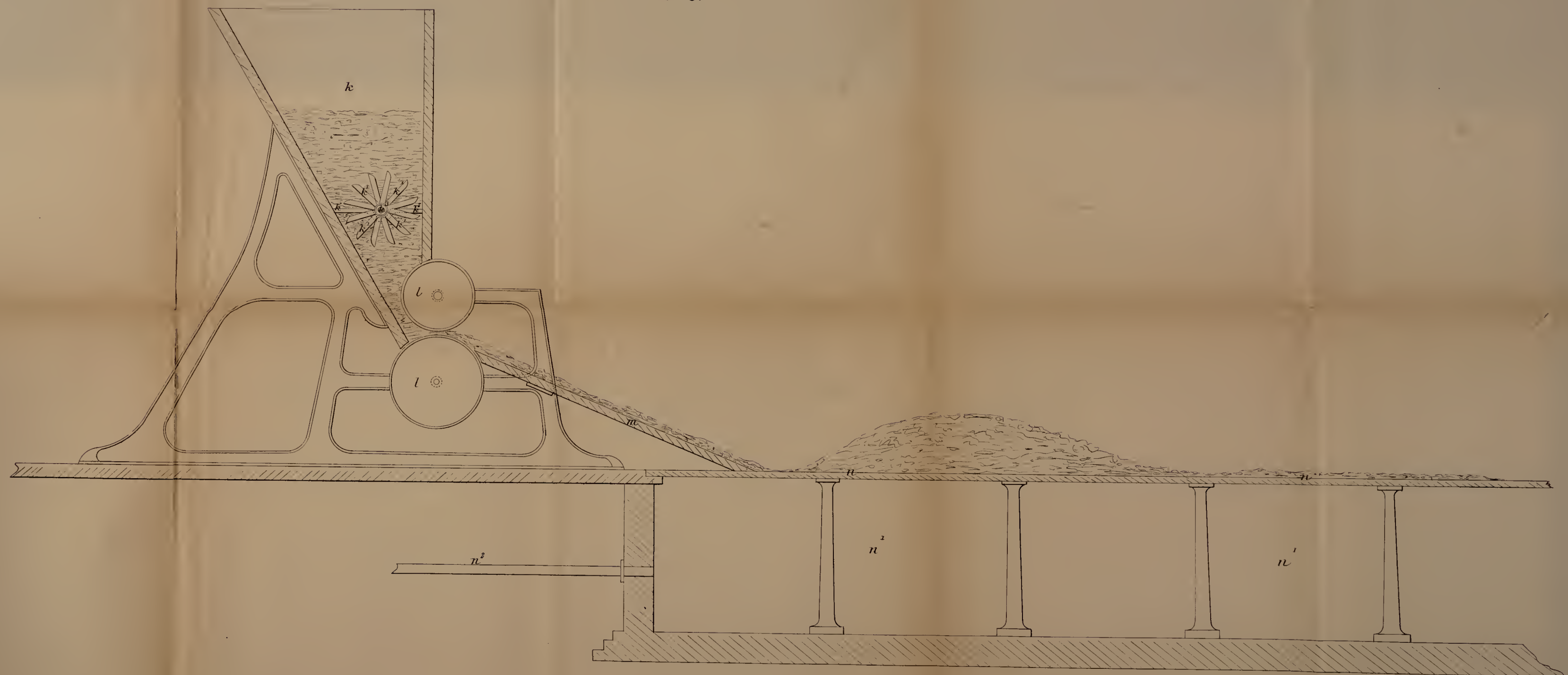


FIG. 9.

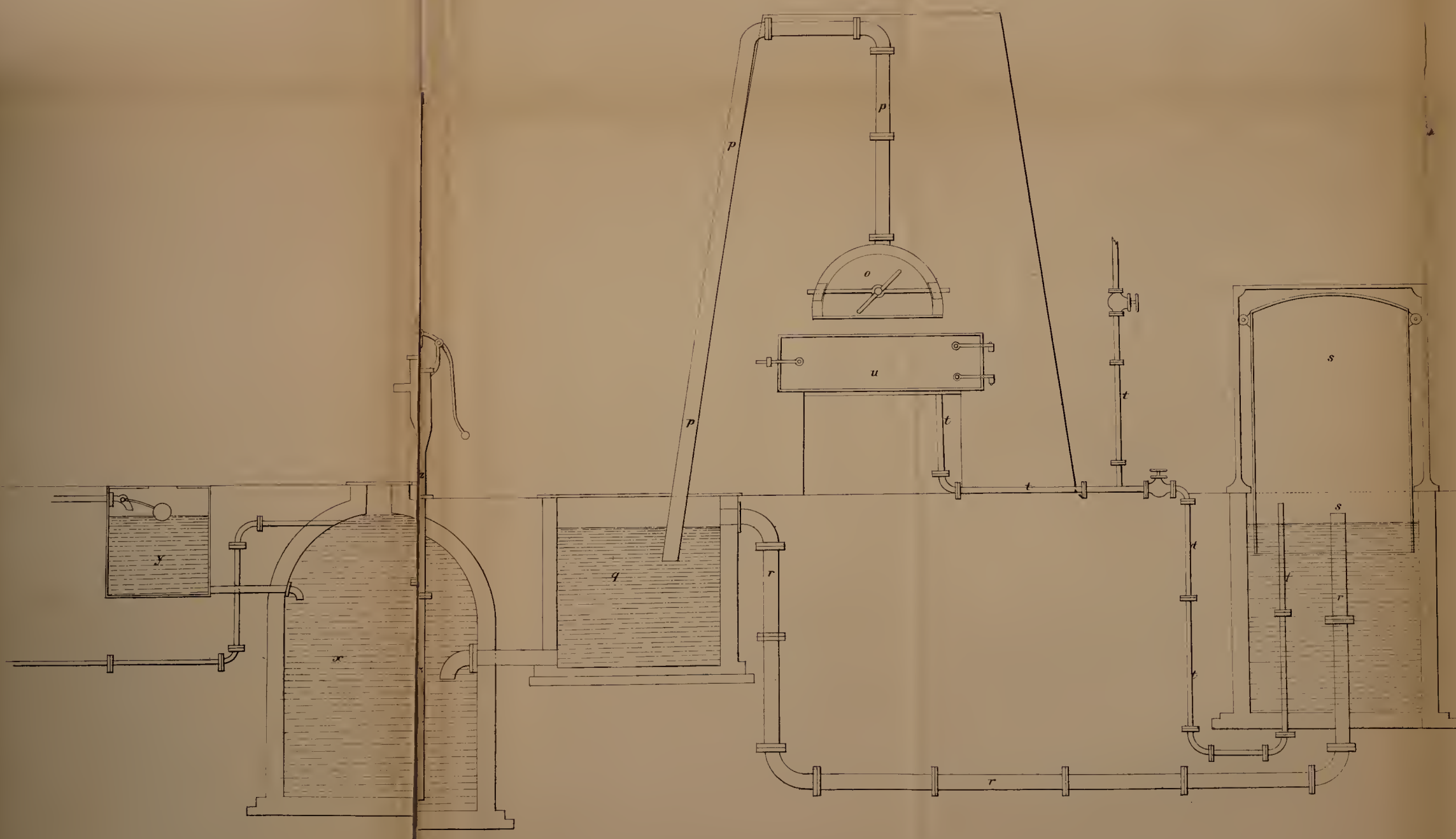


FIG. 12.

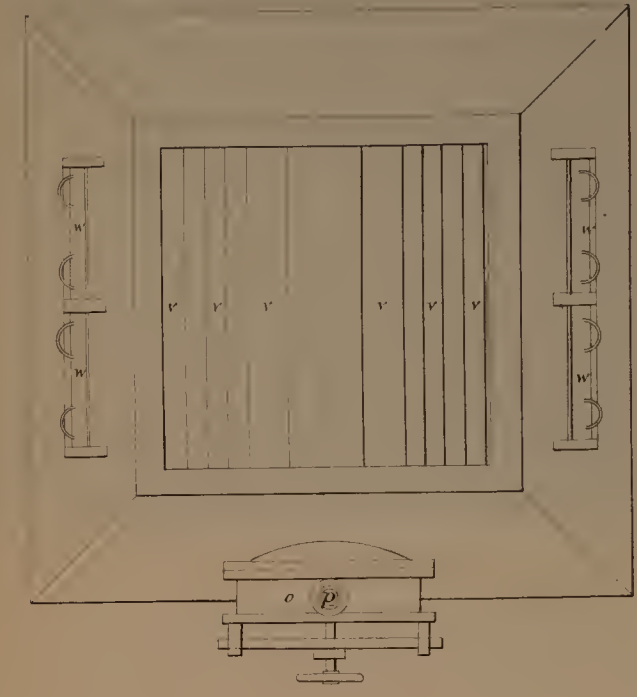


FIG. 10.

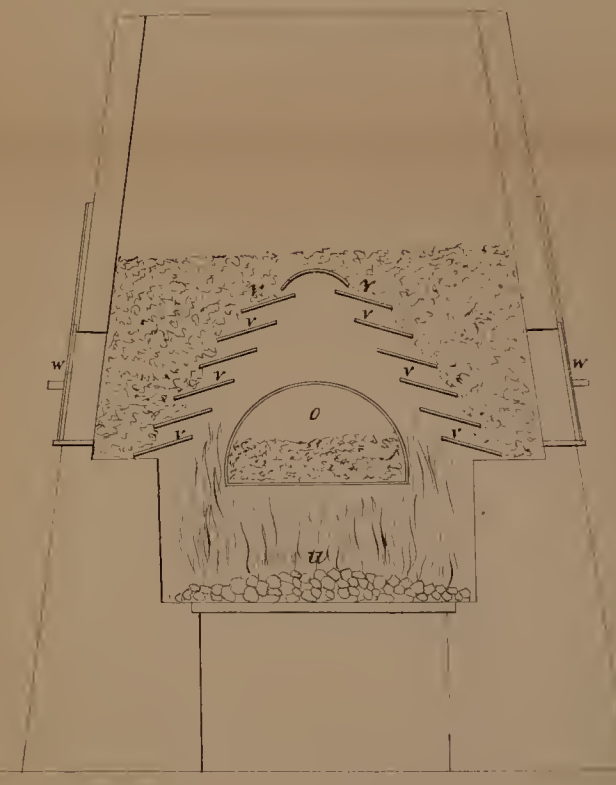
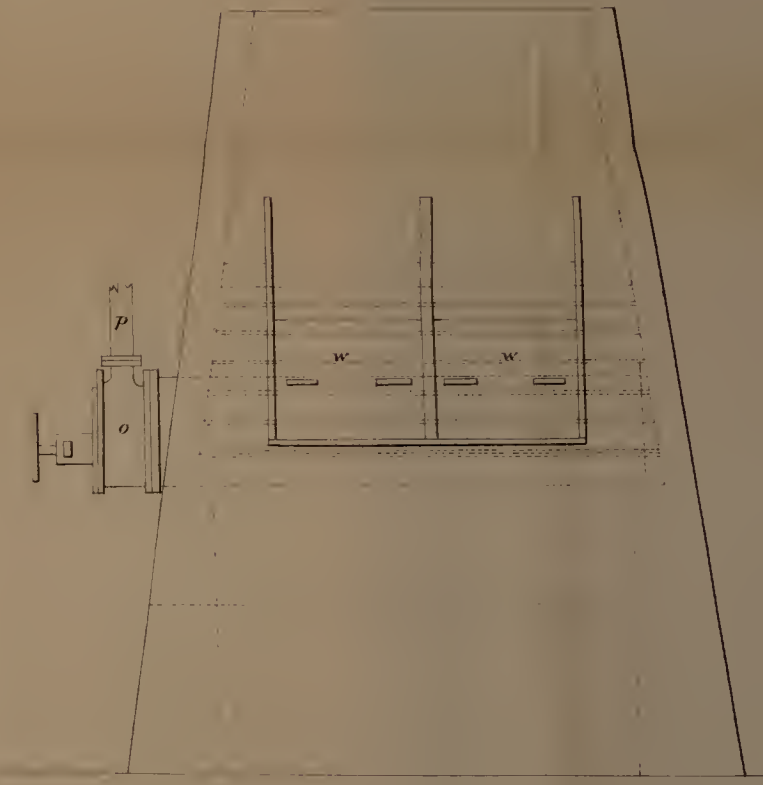


FIG. 11.



The filed drawing is partly colored

Drawn and Stated by Maltby & Sons

